THE PIECES OF PI*

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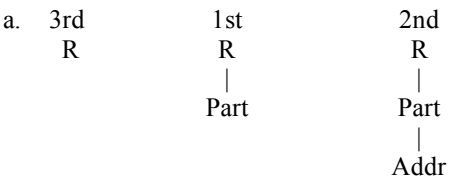
This paper deals with the formal representation of grammatical person (π) in a feature-geometric framework. We suggest an alternative to the featural representations proposed by Harley and Ritter (2002) for languages with an inclusive–exclusive contrast. Our alternative account is motivated theoretically by the idea that the presence in a language of a complex feature-geometric dependency structure should entail the presence of all its possible substructures. Empirically, the implementation of this idea turns out to make a stronger prediction than Harley and Ritter's structures about the range of person hierarchy phenomena we expect to find in any language; it also, as we argue in section 4, is more fully compatible with Harley and Ritter's own view of how morphological representations are acquired.

1. Two Approaches to the Geometry of Person Features

1.1 Harley and Ritter (2002)

Harley and Ritter (2002) propose the structures in (1) for languages with three-way person contrasts.

(1) a.



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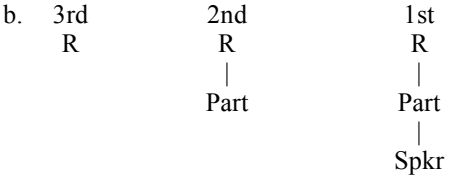

The Participant node (Part) distinguishes first and second persons—discourse participants—from third persons. Within the category of participants, languages differ as to which of first and second person is marked. If second

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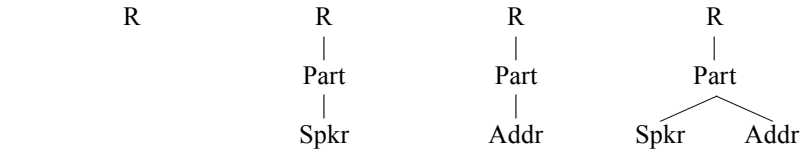
person is marked, then the language makes use of the feature Addressee (Addr), and has the structures given in (1a). If first person is marked, then the language does not use Addressee, but rather Speaker (Spkr), giving the structures in (1b). The interpretation of a structure with a bare Participant feature thus depends on which of the marked dependents the language uses. If the language uses Addressee, then a bare Participant feature is interpreted as first person; if Speaker is used, a bare Participant feature is interpreted as second person.

The relative featural markedness of first, second and third person underlies person hierarchies, as pointed out by Harley (1994). Precedence in an agreement hierarchy is expected to correspond to the presence of more featural structure. For example, Kashmiri, which according to Nichols (2001) exhibits a 1st > 2nd > 3rd person hierarchy, would have the representations in (1b).

Not all languages make use of only one of the features Speaker and Addressee, according to Harley and Ritter. Languages with an inclusive–exclusive distinction use both features, as shown in (2).

(2)

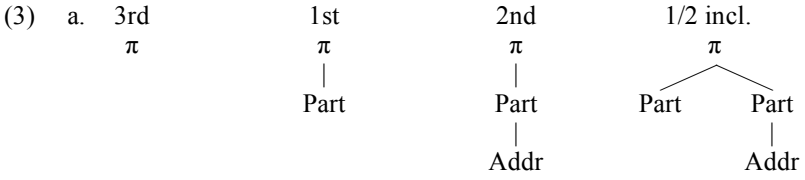


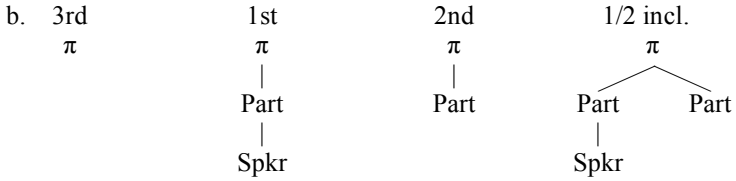
Note that in this system, no use is made of a representation with a bare Participant feature, and first and second person exclusive are treated as equally marked.

1.2 A New View of Inclusives

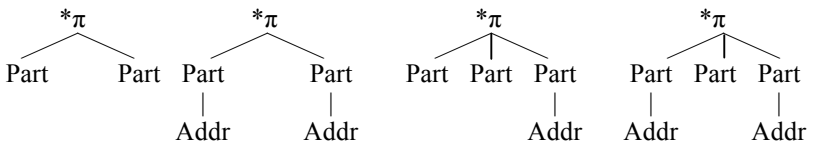
The proposal to be made here keeps to the generalization that a given language makes use of only one of the features Speaker and Addressee. There is always an unmarked participant, which is always represented by a bare Participant feature. Inclusive forms are represented not by a single Participant feature with two marked dependents, but rather by a single π node with two Participant dependents. This permits two possible sets of representations, as shown in (3), the choice between them depending on whether the language treats first or second person as the marked participant.

(3) a.



b. 

The formal property that characterizes languages with an inclusive-exclusive distinction is thus the possibility of more than one Participant dependent on a single instance of π. We assume that non-occurring combinations of nodes, such as those in (4), are ruled out by a suitably adapted version of the Obligatory Contour Principle (Leben 1978). In particular, since the representations are dependency structures whose elements are not linearly ordered, the relevant principle can be stated solely in terms of dominance relations, and prohibits identity between sister nodes.

(4) 

2. Hierarchies and Four-Way Distinctions: π in Algonquian

The empirical differences between (2) and (3) are subtle, but the two theories crucially differ in the predictions they make for languages that have both an inclusive–exclusive contrast and a discernible person hierarchy. Algonquian languages, which meet these two criteria, provide a concrete example of the relevant sort of system.

2.1 The Facts

The Algonquian languages exhibit a 2nd > 1st > 3rd person hierarchy, which can be seen in the verbal agreement morphology illustrated by the Cree examples in (5).[1] The prefix (or proclitic) *ki-* indicates the presence of a second-person argument, regardless of whether that argument is a subject (as in (5a,c)) or a direct object (as in (5b,d)). In the absence of a second-person argument, a first-person subject or object is marked by *ni-*, as in the examples in (5e,f).

[1]The data shown here are in Plains Cree, drawn from Wolfart (1973) and Wolfart and Ahenakew (1998).

(5)

	DIRECT	INVERSE
2 > 3:	a. ki+waːpam+aːw 2+see+3.DIR 'You see him/her.'	b. ki+waːpam+ik 2+see+3.INV 'He/she sees you.'
2 > 1:	c. ki+waːpam+in 2+see+1.DIR 'You see me.'	d. ki+waːpam+itin 2+see+1.INV 'I see you.'
1 > 3:	e. ni+waːpam+aːw 1+see+3.DIR 'I see him/her.'	f. ni+waːpam+ik 1+see+3.INV 'He/she sees me.'

The forms in (6) illustrate the inclusive–exclusive distinction in Cree, and its interaction with the person hierarchy. Inclusive forms, such as (6b), bear the second-person *ki-* prefix rather than the first-person *ni-*.

(6) a. ni+misikiti+naːn
1+big+1.PL
'We (excl.) are big.'

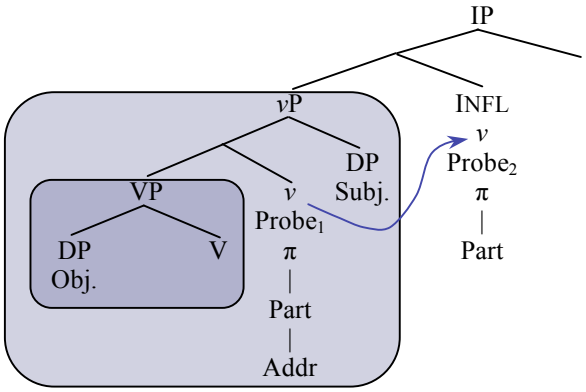
b. ki+misikiti+(naː)naw
2+big+INCL.PL
'We (incl.) are big.'

c. ki+misikiti+naːwaːw
2+big+2.PL
'You (excl. pl.) are big.'

2.2 The Person Hierarchy in the Syntax

Adapting Béjar's (2003) treatment of Nishnaabemwin, we propose that the Cree person agreement hierarchy can be accounted for by the interaction of syntactic probes and feature-geometric structures, as illustrated in (7). Prefixal agreement is due to a probe that originates in *v*, and is initially specified for the features [π[Part[Addr]]]. The search space initially available to this probe, indicated by the inner box in (7), is VP. If the probe finds within this search space a DP that matches its features—which will happen if and only if there is a second-person direct object—then Agree takes place, and the matched features are spelled out by the prefix *ki-*. If no match is found on this first pass, then a rule of Partial Default Agreement deletes the Addressee feature from the probe, so that it is specified only with [π[Part]]. The *v* head with the reduced probe moves to INFL, from which vantage point its search space includes all of *v*P (the outer box in (7)). The probe will now match and agree with a second- or first-person subject, if there is one, or, failing that, with a first-person object. A match with a second-person subject will produce *ki-*; a first-person subject or object will result in *ni-*. If there are no DPs marked for Participant, then default third-person agreement morphology appears.

(7)



2.3 Typological Predictions

Both our feature geometry in (3a) and Harley and Ritter's in (2) are compatible with the Algonquian facts: given either set of representations, a probe for [π[Part[Addr]] will match only second persons (exclusive or inclusive), and a probe for [π[Part]] will match both second and first persons. However, the representations in (2) and (3) make different typological predictions about the possible range of similar systems.

Under our feature geometries in (3), only one dependent of Participant may be marked in any one language. In Cree, for which we propose (3a), the marked dependent is Addressee; we thus predict that wherever the Cree person hierarchy manifests itself through mechanisms like the one in (7), second persons will always take precedence over first persons. In a language with the system in (3b), first persons will always take precedence over second persons. No language is expected to have a mixture of person hierarchies in which the highest-ranked person is sometimes the speaker and sometimes the addressee.

A split system along these lines is, however, predicted by the Harley and Ritter geometry in (2). If both Speaker and Addressee are present as marked features in a single language, then that language could in principle have some probes that are initially specified with [π[Part[Addr]]] and others that are initially specified with [π[Part[Spkr]]]. The result would be a system in which the person hierarchy sometimes appears to be 2nd > 1st > 3rd and at other times appears to be 1st > 2nd > 3rd. If no such system is attested, then the geometries in (3) are to be preferred over the one in (2).

3. The Interpretability of Bare Participant

3.1 Theoretical Considerations

Much of the predictive power of privative feature systems, especially as applied to typological questions, depends on the assumption that every possible feature structure, including a representation with no features at all, is interpretable. In Distributed Morphology, this means that any well-formed arrangement of the features used by the language will be able to be spelled out and interpreted.

Harley and Ritter seem to assume that their representations meet this condition, as shown by their comment about feature acquisition:

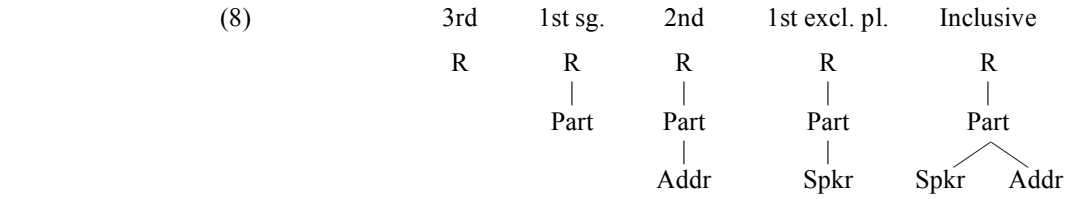
> Assuming a model of feature acquisition along the lines of Rice & Avery 1995 or Brown 1997, we expect that if a language has a pronoun with a complex geometry, the simpler geometries that form the subconstituents of the complex geometry are also available in the language […] (Harley and Ritter 2002: 509).

Under (2), however, a bare Participant node in a language using both Speaker and Addressee normally has no interpretation. This contradicts the statement above, and weakens the theory. Other things being equal, we therefore take the system in (3) to be preferable.

3.2 Empirical Considerations: Kwakiutl and Maxakalí

However, all other things are not necessarily equal: while the structure [π[Part]] cannot contrast in person with both [π[Part[Spkr]]] and [π[Part[Addr]]], Harley and Ritter suggest that in at least some instances, the underspecified structure can instead mark a person-specific contrast in number. They claim that Kwakiutl (Kwakwala) and Maxakalí exhibit number distinctions only in the first person, and that "these languages make no number distinctions elsewhere in the grammar" (Harley and Ritter 2002: 503). They therefore propose that these languages make no use of the usual number features (Group and Minimal in their system), and instead attribute the restricted number contrast to the person feature system. Harley and Ritter's feature geometry in (2) provides precisely the right number of distinct representations for the task, as shown in (8):

(8)



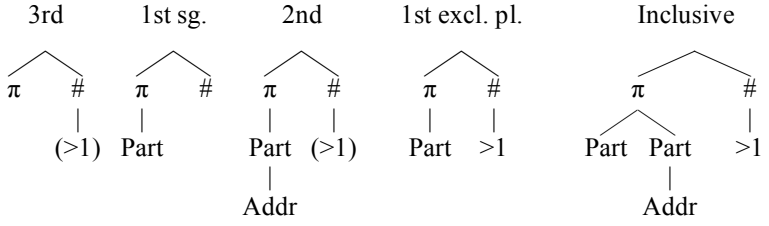
	3rd	1st sg.	2nd	1st excl. pl.	Inclusive
Maxakalí	('ũ)	'ũg/'ũk	'a	yũmũg	'ũmũg
Kwakiutl	Ø	-En	-Es	-Enu$^{\varepsilon}\underset{\cdot}{x}^{u}$	-Ens

While Harley and Ritter's system does indeed make it possible to account for these pronoun systems without recourse to number features, the solution comes at a fairly high price. First, it entails abandoning the idea that every feature's semantic contribution is cross-linguistically consistent. Here, the effect of adding Speaker to a bare Participant feature is to change the interpretation from first person singular to first person exclusive plural. One might propose that, since a bare Participant feature is interpreted as referring to the speaker, the addition of a marked feature specifying Speaker might be seen as adding a second speaker, giving a plural interpretation. However, Harley and Ritter point out quite correctly that first person exclusives are normally interpreted as referring not to more than one speaker, but rather to a single speaker and one or

more third persons. The relation between the features making up the first person exclusive plural and their interpretation must therefore be seen as arbitrary. And, since the language makes use of both Speaker and Addressee, there is no particular reason that a bare Participant feature should be interpreted as contrasting in person with Addressee, and in number with Speaker, rather than the other way around.

However, the approach taken by Harley and Ritter does make it possible to specify all the pronouns with no use of number features. Under the system in (3), this cannot be done; a number feature is required. The representations (3) provides for pronouns in Kwakiutl and Maxakalí are given in (9); here, we represent plural number with the feature >1, as proposed by Cowper (2003).

(9)



M:	('ũ)	'ũg/'ũk	'a	yũmũg	'ũmũg
K:	Ø	-En	-Es	-Enu$^{\varepsilon}$x̣^{u}	-Ens

These representations permit a consistent interpretation to be assigned to each feature, but they do not predict that overt number contrasts are necessarily confined to first person forms in these languages. The theoretical choice between the two approaches thus rests on the question of whether it is preferable to eliminate number features from the grammar entirely, at the cost of weakening the formal elegance of the person features, or to retain the formal elegance of the person features, at the cost of including in the grammar number features for which there is very little motivation.

Ideally, it should be possible to decide the question empirically. For example, if it could be shown that number features are independently required in Kwakiutl or Maxakalí, then there is little to be gained by eliminating them from the pronoun system. To this end, consider what Boas (1900: 712) has to say about person and number agreement in Kwakiutl (emphasis added):

> Personal pronouns appear mostly incorporated in the verb. The pronominal form, which we designate as "first person plural," is not a true plural. Plurality implies the presence of several individuals of the same kind. A plurality of speakers is seldom possible; but our "we" expresses either "I and thou," or "I and he." It is therefore not surprising that many languages, and among them the Kwakiutl, use distinct forms for these two ideas. On the other hand, **the second and third persons plural are real plurals, and are designated in Kwakiutl by a suffix, -xʻdaᵉxᵘ, which precedes the pronominal ending.** In the Hē'iltsaq^{u} dialect this plural is expressed by reduplication.

Boas (1932: 91) also discusses plural inflection in Kwakiutl, and notes the collapse of the plural with the distributive:

> A second change has occurred in the formation of plural forms. There are many indications of the existence of an old distributive as distinguished from the plural.
>
> *a$^{\varepsilon}$wa´* a rocky place; *ē$^{\varepsilon}$a$^{\varepsilon}$wa´* plural; *ała$^{\varepsilon}$wa´* distributive
>
> *ā´$^{\varepsilon}$waq̣ē$^{\varepsilon}$* place between; *ē$^{\varepsilon}$a$^{\varepsilon}$wa´gē$^{\varepsilon}$* plural; *ała$^{\varepsilon}$waq̣ē$^{\varepsilon}$* distributive
>
> The plural is formed by reduplication of the first consonant followed by *ē*; distributives are formed by reduplication of the first consonant followed by *ał*. There are other forms that suggest a distinction between plural and distributive, particularly in those cases in which both occur.
>
> […]
>
> At present the older Indians use only one form for the plural and distinguish between plural and distributive in exceptional cases only.

It therefore seems that the singular-plural distinction is made in Kwakiutl, not only with first-person pronouns, but also robustly in nominals and in the agreement system.

As for Maxakalí, Popovich (1986: 351 and 358, note 2), has this to say:

> [The] completely ergative case system […] is reflected in the […] number agreement between verbs and nouns, where the singular–plural transitive verbs agree with the number of the object and the singular–plural intransitive verbs with the subject. In about 20% of the cases, verb sets are used to distinguish number. Transitive verb sets distinguish between singular and plural objects, and intransitive verb sets distinguish between singular and plural subjects. The members of the sets are two completely different verbs; i.e. their forms do not resemble each other.

Again, it seems that number features are required in the grammar of Maxakalí, and that little is to be gained by eliminating them from the pronoun representations.

If Kwakiutl and Maxakalí indeed lack grammatical number outside of the first person, then Harley and Ritter's geometry would capture this generalization relatively neatly, but at some theoretical cost. If number features are needed elsewhere in the grammars of these languages, there is no reason to pay that price.

4. Conclusion: Markedness and Acquisition

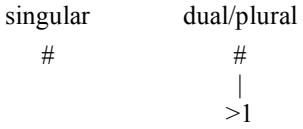
The representations we have proposed in (3), then, make two predictions that differ from those of Harley and Ritter's representations in (2). We predict that

no language uses both Speaker and Addressee as marked features, and that therefore, in any one language, either first persons or second persons will be represented by a bare Participant node.

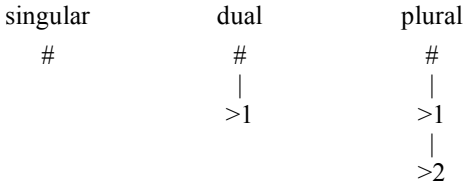
These predictions, which follow from the assumption that underspecified representations are always meaningful, parallel those made by Cowper (2003) for number systems. In Cowper's system, languages with a two-way number contrast encode that contrast in the presence or absence of the feature >1, as in (10a); languages with a three-way number contrast distinguish the plural from the dual by means of a feature >2, which is a dependent of >1, as in (10b).

(10) Number features according to Cowper (2003)

a. Two-way number system



b. Three-way number system



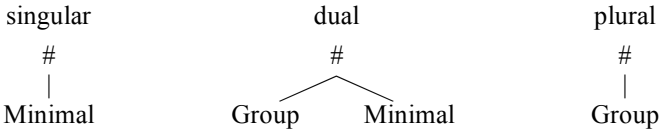
In the systems in (10), a bare number node is always interpreted as singular, and dual and plural are consistently marked with >1. The feature >1 with no dependent is always interpretable, and always indicates reference to a non-singleton set. To the extent that its interpretation varies, the variation can be attributed to the different systems of contrasts in which it appears: if the system makes use of the feature >2, then bare >1 means 'exactly two'; if the system does not use >2, then bare >1 encompasses the plural as well as the dual. (For analogous cases of contrast-dependent interpretations of phonological features, see Dresher (1998, 2002).)

Harley and Ritter's (2002) number features differ from those of Cowper (2003) in much the same way in which their person feature geometries differ from the ones we propose in (3). Their representations for a two-way number system, shown in (11a), are essentially equivalent to (10a): Cowper's >1 feature has precisely the same interpretation as their Group feature. However, their representations for a three-way system, in (11b), use a feature Minimal that is a sister, not a dependent, of Group, and make no use of a bare # node.

(11) Number features according to Harley and Ritter (2002)

a. Two-way number system

b. Three-way number system



Cowper (2003) discusses some of the theoretical and empirical consequences of the difference between (10b) and (11b). A more general difference, which applies as well to the person feature geometries in (3) and (2), has to do with the process by which such geometries are acquired.

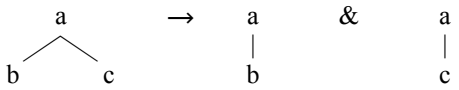
According to Harley and Ritter (2002: 499), acquisition is a purely structure-building process that "proceeds from the top down; a given node must be acquired before its dependents." This characterization is readily applicable to the systems in (10) and (3): for example, if number contrasts are represented as in (10), then a learner of a language with a three-way number contrast would be expected first to master the singular–non-singular contrast, by acquiring the feature >1, and only afterwards to distinguish plural from dual, by learning the contrast between a bare >1 feature and one with the dependent >2.

It is less obvious, however, how this view of acquisition applies to Harley and Ritter's own structures in (2) and in (11b). If there is no interpretation for a bare Participant feature in a language such as Cree, then how would a learner of Cree acquire the Participant feature at all? Or, in a language with a three-way number contrast, how would a learner acquire the # node, which in (11b) has no interpretation in the absence of its dependents? If the child did acquire such a node, and assign it an interpretation, then that node would later have to be replaced—not supplemented—by a representation including a marked dependent feature. In that case, the process of acquisition could not be exclusively one of structure building. Harley and Ritter's representations, to the extent that they exclude logically possible substructures, are incompatible with their description of how acquisition works.

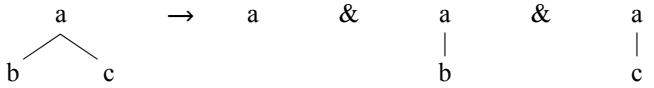
In light of this, we propose the principle stated in (12):

(12) FEATURE INTERPRETABILITY PRINCIPLE (FIP):
All possible combinations of features in a geometry are interpretable.

This principle encompasses an implicational relation stated by Harley and Ritter (2002: 509), to the effect that any two features that appear as sisters (such as Group and Minimal, or Speaker and Addressee) must also be capable of appearing independently; this is schematized in (13).

(13) 

The Feature Interpretability Principle, however, makes a stronger prediction than this, as shown in (14): every feature must also be interpretable in the absence of any or all of its potential dependents.

(14) 

This principle permits a purely structure-building acquisition process, and makes testable predictions about the typology of person and number systems. It is of course possible that these predictions may turn out to be too strong, and holding to a restrictive theory such as the one proposed here will not only bring any empirical problems into sharp relief, but will also provide a means of evaluating possible ways of solving them.

References

Béjar, Susana. 2003. Phi-syntax: A theory of agreement. Doctoral dissertation, University of Toronto.

Boas, Franz. 1900. Sketch of the Kwakiutl Language. *American Anthropologist* 2: 708–721.

Boas, Franz. 1932. Notes on some recent changes in the Kwakiutl language. *International Journal of American Linguistics* 7: 90–93.

Brown, Cynthia A. 1997. Acquisition of segmental structure: Consequences for speech perception and second language acquisition. Doctoral dissertation, McGill University.

Cowper, Elizabeth. 2003. Why dual is less marked than plural. Proceedings of NELS 34. Amherst, MA: GLSA.

Dresher, B. Elan. 1998. On contrast and redundancy. Ms., University of Toronto.

Dresher, B. Elan. 2002. The contrastive hierarchy in phonology. Paper presented at the Second International Conference on Contrast in Phonology, University of Toronto.

Harley, Heidi. 1994. Hug a tree: Deriving the morphosyntactic feature hierarchy. *MIT Working Papers in Linguistics* 21: 289–320. Cambridge, MA: MIT.

Harley, Heidi, and Elizabeth Ritter. 2002. Person and number in pronouns: A feature-geometric analysis. *Language* 78.3: 482–526.

Leben, William R. 1978. The representation of tone. In *Tone: A linguistic survey*, edited by V. Fromkin. New York: Academic Press, 177–219.

Nichols, Lynn. 2001. The syntactic basis of referential hierarchy phenomena: Clues from languages with and without morphological case. *Lingua* 111: 515–537.

Popovich, Harold. 1986. The nominal reference system of Maxakalí. In *Pronominal Systems*, edited by Ursula Wiesemann. Tübingen: Gunter Narr Verlag.

Rice, Keren, and Peter Avery. 1995. Variability in a deterministic model of language acquisition: A theory of segmental elaboration. In *Phonological acquisition and*

phonological theory, edited by John Archibald, 23–42. Hillsdale, N.J.: Lawrence Erlbaum.

Wolfart, H. Christoph. 1973. Plains Cree: A grammatical study. *Transactions of the American Philosophical Society* 63. Philadelphia: American Philosophical Society.

Wolfart, H. Christoph, and Freda Ahenakew. 1998. *The student's dictionary of literary Plains Cree, based on contemporary texts*. Winnipeg: Algonquian and Iroquoian Linguistics.